[P-058/SE-6] Characteristic plasma properties during flow bursts and observational test of the ideal MHD frozen-in condition

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We have investigated some physical properties of plasmas during flow burst events (FBs) in the near-Earth magnetic tail. The ideal MHD frozen-in condition is also tested for the FBs by comparing $-(VxB)_y$ with E_y. For this investigation, we have selected 83 FBs from the Cluster satellites (C1,C4) from 2001 to 2003, and examined the properties of number density, thermal temperature, ion pressure, and total pressure during FBs. We found that FBs are characterized by having a lower density, a higher temperature compared to those of its surroundings, and the total pressure is comparable, being consistent with what have been already known. In addition, we have newly found that the density depletion is more significant for higher speed FBs than for lower speed ones, implying that more density-depleted FBs move faster toward the Earth as if bubbles with lower density float up faster in a liquid. While this new result seems to support the conventional fluid (MHD) description of FBs, we have attempted to determine the extent to which the MHD description is actually valid for FBs. For this purpose we performed a simple test of the MHD frozen-in condition by estimating the difference between $-(VxB)_y$ and E_y for each of our FBs, and found that the difference is a few mV/m on average for most of the FBs regardless of their flow speed. However, we also found that even such a small amount of the MHD deviation can be occasionally non-negligible from the viewpoint of magnetic flux transport. Specifically, the amount of magnetic flux transported during a FB interval, as defined by the time-integration of $-(VxB)$ electric field over the FB interval, can differ significantly from what would be expected from the ideal MHD frozen-in condition. This difference is found to be more serious for lower speed FBs.